

# NASA TECH BRIEF

## *Lewis Research Center*



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### Use of Thin Plastic Films at Cryogenic Temperatures

Investigations have been conducted into the use of plastic materials, particularly thin polymeric films, for the construction of reliable, lightweight, expulsion bladders for liquefied gases. The studies included the selection of polymeric films for use with specific cryogenic liquids, the selection of compatible adhesive systems for expulsion bladder construction, and the evaluation and testing of such bladders.

Criteria for the investigations included minimal bladder weight, low gas porosity values for the expulsion membrane, and practical, economical fabrication techniques for the entire assembly. Impact tests were used for the compatibility studies, and dynamic loading tests were used to study the structural capability of the bladders. Also, adhesive systems which could bond the plastic sheets and were compatible with cryogenic liquids were selected and evaluated.

Data presented in the reports detailing the results of the investigations include a selection of commercially available plastic film materials that remain flexible at cryogenic temperatures and resist failures caused by folds and wrinkles created during the expulsion cycle. The reports also include a variety of fabrication techniques, as well as data summarizing the potential capabilities of thin-film plastic materials.

#### Notes:

1. The following documentation may be obtained from:  
National Technical Information Service  
Springfield, Virginia 22151  
Single document price \$3.00  
(or microfiche \$0.95)

References: NASA CR-54433 (N65-35071),  
Development of Improved Polymeric Materials  
for Cryogenic Propellant Tank Liners and  
Positive Expulsion Bladders

NASA TM-S-1555 (N68-20329), Cryogenic  
Positive Expulsion Bladders

NASA CR-72134 (N67-28755), Compatibility  
of Polymeric Films with Liquid Oxygen

NASA CR-72115 (N68-21916), Development  
of Cryogenic Positive Expulsion Bladders

NASA CR-72432 (N69-10712), Liquid Hydro-  
gen Positive Expulsion Bladders

NASA CR-72418 (N68-33321), Polymeric  
Positive Expulsion Bladders for Liquid Oxygen  
Systems

NASA CR -72502 (N69-22785), Development  
of Liquid Oxygen Compatible-Adhesive System

2. Technical questions may be directed to:  
Technology Utilization Officer  
Lewis Research Center  
21000 Brookpark Road  
Cleveland, Ohio 44135  
Reference: B72-10038

#### Patent Status:

No patent action is contemplated by NASA

Source: R. F. Lark  
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